

paragraph (a) of this section at the speeds and corresponding device positions that the mechanism allows.

[Amdt. 23-7, 34 FR 13089, Aug. 13, 1969]

CONTROL SURFACE AND SYSTEM LOADS

§ 23.391 Control surface loads.

The control surface loads specified in §§ 23.397 through 23.459 are assumed to occur in the conditions described in §§ 23.331 through 23.351.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-48, 61 FR 5145, Feb. 9, 1996]

§ 23.393 Loads parallel to hinge line.

(a) Control surfaces and supporting hinge brackets must be designed to withstand inertial loads acting parallel to the hinge line.

(b) In the absence of more rational data, the inertial loads may be assumed to be equal to KW , where—

- (1) $K=24$ for vertical surfaces;
- (2) $K=12$ for horizontal surfaces; and
- (3) W =weight of the movable surfaces.

[Doc. No. 27805, 61 FR 5145, Feb. 9, 1996]

§ 23.395 Control system loads.

(a) Each flight control system and its supporting structure must be designed for loads corresponding to at least 125 percent of the computed hinge moments of the movable control surface in the conditions prescribed in §§ 23.391 through 23.459. In addition, the following apply:

(1) The system limit loads need not exceed the higher of the loads that can be produced by the pilot and automatic devices operating the controls. However, autopilot forces need not be added to pilot forces. The system must be designed for the maximum effort of the pilot or autopilot, whichever is higher. In addition, if the pilot and the autopilot act in opposition, the part of the system between them may be designed for the maximum effort of the one that imposes the lesser load. Pilot forces used for design need not exceed the maximum forces prescribed in § 23.397(b).

(2) The design must, in any case, provide a rugged system for service use, considering jamming, ground gusts, taxiing downwind, control inertia, and

friction. Compliance with this subparagraph may be shown by designing for loads resulting from application of the minimum forces prescribed in § 23.397(b).

(b) A 125 percent factor on computed hinge moments must be used to design elevator, aileron, and rudder systems. However, a factor as low as 1.0 may be used if hinge moments are based on accurate flight test data, the exact reduction depending upon the accuracy and reliability of the data.

(c) Pilot forces used for design are assumed to act at the appropriate control grips or pads as they would in flight, and to react at the attachments of the control system to the control surface horns.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-7, 34 FR 13089, Aug. 13, 1969]

§ 23.397 Limit control forces and torques.

(a) In the control surface flight loading condition, the airloads on movable surfaces and the corresponding deflections need not exceed those that would result in flight from the application of any pilot force within the ranges specified in paragraph (b) of this section. In applying this criterion, the effects of control system boost and servo-mechanisms, and the effects of tabs must be considered. The automatic pilot effort must be used for design if it alone can produce higher control surface loads than the human pilot.

(b) The limit pilot forces and torques are as follows:

| Control | Maximum forces or torques for design weight, weight equal to or less than 5,000 pounds ¹ | Minimum forces or torques ² |
|--|---|--|
| Aileron: | | |
| Stick | 67 lbs | 40 lbs. |
| Wheel ³ | 50 D in.-lbs ⁴ | 40 D in.-lbs. ⁴ |
| Elevator: | | |
| Stick | 167 lbs | 100 lbs. |
| Wheel (symmetrical) | 200 lbs | 100 lbs. |
| Wheel (unsymmetrical) ⁵ | | 100 lbs. |
| Rudder | 200 lbs | 150 lbs. |

¹For design weight (W) more than 5,000 pounds, the specified maximum values must be increased linearly with weight to 1.18 times the specified values at a design weight of 12,500 pounds and for commuter category airplanes, the specified values must be increased linearly with weight to 1.35 times the specified values at a design weight of 19,000 pounds.